



Published in final edited form as:

J Acquir Immune Defic Syndr. 2017 May 01; 75(Suppl 1): S76–S85. doi:10.1097/QAI.0000000000001336.

Overcoming Health System Challenges for Women and Children Living With HIV Through the Global Plan

Surbhi Modi, MD, MPH^{*}, Tegan Callahan, MPH^{*}, Jessica Rodrigues, MS[†], Mwikemo D. Kajoka, MD, MPH[‡], Helen M. Dale, BVSc, MBChB^{*}, Judite O. Langa, MD, MPH[§], Marilena Urso, MD[§], Matsepeli I. Nchephe, BSN^{||}, Helene Bongdene, MD[¶], Sostena Romano, MSN, MBA[†], and Laura N. Broyles, MD^{*}

^{*}Division of Global HIV and Tuberculosis, Centers for Disease Control and Prevention, Atlanta, GA

[†]HIV/AIDS Section United Nations Children's Fund, New York, NY

[‡]Department of Preventive Services, Reproductive and Child Health Section, PMTCT Programme Ministry of Health, Community Development, Gender, Elderly, and Children, Dar es Salaam, United Republic of Tanzania

[§]Division of Global HIV and Tuberculosis Centers for Disease Control and Prevention, Maputo, Mozambique

^{||}Ministry of Health, Maseru, Lesotho

[¶]Ministry of Health, N'Djamena, Republic of Chad

Abstract

To meet the ambitious targets set by the Global Plan Towards the Elimination of New HIV Infections Among Children by 2015 and Keeping Their Mothers Alive (Global Plan), the initial 22 priority countries quickly developed innovative approaches for overcoming long-standing health systems challenges and providing HIV testing and treatment to pregnant and breastfeeding women and their infants. The Global Plan spurred programs for prevention of mother-to-child HIV transmission to integrate HIV-related care and treatment into broader maternal, newborn, and child health services; expand the effectiveness of the health workforce through task sharing; extend health services into communities; strengthen supply chain and commodity management systems; reduce diagnostic and laboratory hurdles; and strengthen strategic supervision and mentorship. The article reviews the ongoing challenges for prevention of mother-to-child HIV transmission programs as they continue to strive for elimination of vertical transmission of HIV infection in the post-Global Plan era. Although progress has been rapid, health systems still face important challenges, particularly follow-up and diagnosis of HIV-exposed infants, continuity of care, and the promotion of services that are respectful and client centered.

Correspondence to: Surbhi Modi, MD, MPH, Centers for Disease Control and Prevention, 1600 Clifton Road NE, MS E-04, Atlanta, GA 30329 smodi@cdc.gov.

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the U.S. Centers for Disease Control and Prevention.

The authors have no funding or conflicts of interest to disclose.

Keywords

HIV; health systems strengthening; prevention of mother-to-child HIV transmission

INTRODUCTION

The Global Plan Towards Eliminating New HIV Infections Among Children by 2015 and Keeping Their Mothers Alive (Global Plan)¹ identified 22 priority countries, all of which committed to reducing the number of new childhood HIV infections by 90% and reducing the number of HIV-related maternal deaths by 50% within a 5-year period.¹ In this article, we describe how these priority countries identified long-standing health system challenges and developed innovative strategies to strengthen the health system elements required to meet the pace of scale-up and the ambitious Global Plan targets. We also review the ongoing challenges as prevention of mother-to-child transmission (PMTCT) programs continue to strive for elimination of vertical transmission of HIV infection in the post-Global Plan era.

SERVICE INTEGRATION AND DECENTRALIZATION

The Global Plan specifically called for the integration of HIV services into programs for sexual and reproductive health (SRH) and for maternal, newborn, and child health (MNCH) because the HIV and MNCH goals converged, including reducing maternal and infant mortality and leveraging the synergies between the 2 agendas.^{1,2} Both the Global Plan and its targets recognized that sustaining reductions in mother-to-child transmission was inseparable from reducing HIV incidence among adolescent girls and women of reproductive age, addressing family planning needs, and providing comprehensive HIV services for women and children living with HIV.

Integration has taken place at multiple levels in Global Plan priority countries, including at the national level. In Tanzania, the national PMTCT program falls under the Reproductive and Child Health Section of the Ministry of Health. This location facilitates coordinated maternal and child health service delivery regardless of a person's HIV status. Studies of integration of HIV services with SRH and MNCH services have shown benefits for client-provider interactions, time and cost savings for patients, and multiple improved clinical outcomes, including increased antiretroviral therapy initiation and higher uptake of infant HIV testing.³⁻⁹ Although achieving improved clinical outcomes was the ultimate goal for the push to integrate HIV and other health care services, integration also strengthened the health system by expanding the skills of the health care workforce and improving laboratory and clinical infrastructure to provide essential HIV-related and other health services, even in low-level health facilities.^{10,11}

Because SRH and MNCH services are often provided in small health facilities, the push for integration has had the additional result of decentralizing HIV services to primary health facilities, thereby expanding access to health services for women and their families.¹² In 2011, the World Health Organization (WHO) released technical guidance suggesting that the decentralization of services to primary health facilities and the provision of antiretroviral therapy services in the context of MNCH would result in earlier and more regular antenatal

care. This, in turn, would improve early identification of HIV-positive women and children, initiation of early antiretroviral therapy for women and children, and retention in antenatal care, PMTCT, and HIV treatment services, all of which would ultimately improve maternal and child survival.¹³

In the same year, the Malawi Ministry of Health made a major move to decentralize antiretroviral therapy services to primary health facilities when they initiated the “Option B +” policy, which called for immediate initiation of life-long antiretroviral therapy for all HIV-positive pregnant and breastfeeding women.¹⁴ To reach as many women as possible, Malawi made the decision to decentralize and integrate antiretroviral therapy services into all MNCH settings. One year after implementation, the number of pregnant and breastfeeding women starting antiretroviral therapy per quarter in Malawi had increased nearly seven and a half times.¹⁵ Within 4 years, the number of sites actively providing antiretroviral therapy services had increased from 303 to 714, and the proportion of antenatal care clinics providing antiretroviral therapy services increased from 37% in June 2012 to 98% in June 2015.¹² Similar decentralization of services has been seen in other Global Plan countries. For example, in Tanzania, the number of antenatal care clinics providing Option B + services expanded from 1165 in 2013 to 5063 in 2014.¹⁶ As highlighted in Country Case Study 1, decentralized planning was also instrumental to making significant progress toward Global Plan targets in the Republic of Chad.

THE ESSENTIAL ROLE OF TASK SHARING

Strengthening the ability of health systems to deliver care required putting providers with the right skills in the right places. Human resource challenges, particularly a shortage of HIV physician providers, presented a challenge to achieving the Global Plan targets.^{17,18} Although the WHO’s minimum density of health workers (including physicians, nurses, and midwives) needed to achieve coverage of essential health services is 2.3 per 1000 population,¹⁹ new estimates show that countries will need 4.45 health workers per 1000 to meet the demands of universal health coverage and achieve sustainable development goals.²⁰ Data from WHO’s Global Health Observatory repository reveal an average density in the initial 22 Global Plan countries that is well below the recommended threshold: average physician density is only 0.2 per 1000 population, and the average density of nursing and midwifery personnel is 1.3 per 1000 population.²¹

To reach the Global Plan targets, broader health workforce capacity was needed to conduct HIV testing and counseling, initiate and manage antiretroviral prophylaxis for mothers and infants, including assessing clinical eligibility and delivering quality services in new clinical settings. Task sharing is a model of task delegation, where appropriate—either within cadres, between cadres, or to health extension workers (eg, community volunteers, patients, or their families). As part of the HIV response in Africa, non-physician providers have been trained to perform general medical duties related to provision of antiretroviral therapy.²² For example, nurses may initiate treatment and monitor patients on antiretroviral medications, a role originally performed only by physicians. Similarly, lay health counselors may conduct HIV testing, a role originally performed by laboratorians. A systematic review of task sharing of antiretroviral therapy services found no difference in death at 1 year and lower

rates of loss to follow-up at 1 year between nurse-initiated and nurse-managed antiretroviral therapy models and those same services provided by physicians. Through changes in practice, education, policy, and regulation, the expansion of nurse-initiated and nurse-managed antiretroviral therapy has built on general task sharing experiences to help rapidly increase access to antiretroviral therapy services for pregnant women.

Given the dire health worker shortages in many countries with a high HIV burden, the rapid expansion of antiretroviral therapy for HIV-positive pregnant and breast-feeding women through PMTCT programs, especially after the introduction of Option B+ policies, arguably could not have been achieved without task sharing. A 2012 survey of national nursing leaders that included representatives from 12 Global Plan countries found that nurses were prescribing and managing antiretroviral therapy for pregnant women in 9 of these 12 countries.²³ The example of Lesotho illustrates how nurse-initiated and nurse-managed antiretroviral therapy models for pregnant women have facilitated expansion of antiretroviral therapy services, including through integration with MNCH services (see Country Case Study 2). Ongoing support for the professional growth and development of the entire health care workforce will be important to maintain and expand quality HIV-related services for pregnant and breast-feeding women and their children.

STRENGTHENING HEALTH SYSTEMS FOR SUPPORTIVE SUPERVISION

Although task sharing has facilitated rapid decentralization and integration of MNCH, PMTCT, and antiretroviral therapy services, it also has meant that smaller health care facilities and lower-level cadres are assuming multiple new clinical and management responsibilities, including antiretroviral therapy initiation, adherence counseling, recognition of drug toxicities, and recording and reporting of clinical outcomes.

One of the potential challenges with integration of PMTCT and MNCH services is that widespread decentralization of HIV-related care may have unintended negative consequences where demand for services is low. With very few patients, clinical providers may not maintain the clinical expertise needed to provide the highest quality of care; clinical confidence with specialized HIV-related care may especially be an issue when health care duties are shifted to lower-level cadres in sites with low service demand.²⁴ Furthermore, the cost of HIV service provision at remote sites with very few HIV-infected women may be very high. The United States President's Emergency Plan for AIDS Relief (PEPFAR) has highlighted this issue as part of its PEPFAR 3.0 strategy to focus on the "right places," that is, geographic areas and clinical sites with the greatest need for HIV treatment and prevention, to maximize resources and have the greatest impact on controlling the HIV epidemic.²⁵

One strategy that is essential to ensure appropriate clinical management and accurate reporting, as well as to empower staff in their new roles and provide accountability, is the provision of close oversight and quality assurance, especially in the initial phases of service implementation. To meet this need, many countries developed systems for structured supportive supervision and mentoring of newly integrated PMTCT and antiretroviral therapy sites. For example, Malawi instituted a standardized supervisory structure through which all

integrated PMTCT and antiretroviral therapy sites in the country received quarterly visits by a nationally-coordinated, multidisciplinary team composed of technical and supervisory staff from the Ministry of Health and supporting partners, including the US government staff based in Malawi.¹⁵ The visits include collection of key program data elements (eg, number of persons started on antiretroviral therapy, the reason for starting antiretroviral therapy, and retention in care) and review of medical records.

It became apparent that integration of PMTCT and antiretroviral therapy services required a cascade of supervision and coordination across all levels of the health system (national, provincial, district, and site), not just at the facility level. This helped to ensure that the integration of services resulted in a stronger overall approach to health care delivery. In 2010, Zimbabwe adopted a national program of district-level PMTCT focal persons, which deployed experienced registered nurses and/or midwives to support existing Ministry of Health and Child Welfare district health teams.²⁶ The district-level focal persons worked with the district health teams to support facilities in implementation of the revised PMTCT guidelines and with building the capacity of the teams to provide routine supportive supervision to PMTCT sites and monitoring of PMTCT at the district level.²⁷

Engaging key stakeholders at multiple levels of the health system to provide supportive supervision builds capacity throughout the system. Although supportive supervision and mentorship models did not originate with the Global Plan, its emphasis on demonstrating successful approaches to achieving its ambitious targets through innovative strategies highlights the need for expanded focus on these systems.

INCREASING THE ROLE OF COMMUNITY SERVICES TO IMPROVE PMTCT OUTCOMES

The Global Plan explicitly called for increasing the role of community leadership and ownership within local health systems. The Plan also repeatedly urged health systems and health service providers to engage with networks of people living with HIV and to optimize the role of community health workers, citing both actions as important strategies for eliminating mother-to-child HIV transmission and improving clinical outcomes for mothers and children.²⁸ Community health workers in particular have played an instrumental role in improving access, quality, and continuity of HIV care. Because integration and decentralization demand more of formally trained health care workers, community health workers support the optimal functioning of the health system by extending the capacity of physicians and nurses and by serving as a vital link between facilities and communities, thus ensuring the uptake of and retention in services for eliminating new HIV infections among children and keeping their mothers alive.

Before the Global Plan, many of the priority countries established community health worker programs and relied on community-based structures as an integral component of their PMTCT strategies. Since the Plan's inception, however, there has been growing recognition of and evidence for the contributions that community health workers make to HIV-related services for pregnant and breastfeeding women. This includes pretest and adherence counseling, support groups, and follow-up home visits to promote retention.²⁹ Several

Global Plan countries—namely Ethiopia, Ghana, Kenya, Malawi, Uganda, and Zimbabwe—have invested in developing cadres of community health workers. The results include improved PMTCT and MNCH outcomes, including maternal antiretroviral prophylaxis or treatment, infant HIV testing, and antiretroviral therapy initiation among HIV-infected infants, all achieved in a cost-effective manner.^{30–33} In Malawi, the Tingathe program has used specially trained community health workers as case managers to ensure longitudinal care for HIV-infected mothers and their HIV-exposed infants. Mother–infant pairs enrolled in the Tingathe program demonstrated improved PMTCT service utilization compared with pre-intervention performance on multiple indicators, including initiation of antiretroviral prophylaxis or treatment according to national guidelines, as well as identification and follow-up of HIV-exposed infants to determine their final HIV status at the end of breastfeeding.³⁰

Several studies have demonstrated that participation in peer support groups contributes to improved maternal and infant retention in PMTCT programs, early infant HIV testing, exclusive breastfeeding rates, and maternal psychosocial indicators.^{34–36} PMTCT expert client models involve peers who educate and provide psychosocial support to HIV-positive pregnant women and new mothers. A 2013 internal program evaluation of the “mothers2mothers” (m2m) peer support programs across Kenya, Lesotho, Malawi, Swaziland, South Africa, and Uganda found consistently higher uptake of recommended services among m2m program participants than the reported national outcomes, particularly uptake of antiretroviral prophylaxis during pregnancy, HIV-exposed infant services, and antiretroviral therapy among HIV-infected infants.³⁷ Across all country programs, the mother-to-child HIV transmission rate within the m2m program was only 1.9% in 2013.³⁷

With the continued global expansion of antiretroviral therapy services, the promotion of task sharing with community cadres and across health professional cadres will be essential to maintaining and extending the gains made under the Global Plan. The Global Plan generated momentum to expand the role of non-physician and community cadres in health services, which has influenced broader HIV programming and investments: the UNAIDS Fast-Track approach calls for delivery of HIV services through community channels to increase from the current 5%–30%.³⁸ The trend toward health services provided by community-based and lay cadres has the promise to continue reshaping the health system in a positive manner, particularly in light of the more expansive Sustainable Development Goals, which call for expanded access to quality health care services for all. Multiple challenges faced by community health workers need to be addressed, however, including ensuring the clear definition of roles, coordination of community cadres, and sustainable integration of these cadres into the broader health system.³⁹ Investing in further development of community structures, including community health workers, is a vital component of the efforts to improve health services for women and their families.

STRENGTHENING COMMODITY MANAGEMENT

Integrating antiretroviral therapy into PMTCT settings required more than new clinical management guidelines and reporting processes: It dictated a significant expansion and strengthening of the supply chain for HIV commodities.² Close coordination between

PMTCT and antiretroviral therapy programs was important to ensure accurate forecasting and distribution of HIV rapid test kits and antiretroviral medications. The move away from Option A and the availability of inexpensive, efavirenz-containing fixed-dose combinations for pregnant women helped simplify that process substantially.⁴⁰ Planning at the district level was emphasized to ensure that the appropriate commodities were available and distributed to the appropriate clinical sites. At the facility level, staff at PMTCT clinics were charged with management of antiretroviral therapy commodities in addition to their other duties. Because of the significant potential negative consequences of antiretroviral therapy stock-outs (eg, development of drug resistance, treatment failure, and mother-to-child HIV transmission), tasks such as consumption reporting and stock management took on new importance. For this reason, the supportive supervision and mentoring systems adopted by countries usually included an assessment of the adequacy of stock and adherence to commodity management best practices; in addition, standardized tools for consumption reporting were often developed to aid facility staff.

For instance, with support from PEPFAR, the Ministry of Health in the United Republic of Tanzania developed a rapid assessment and response systems called LARS [Lifelong Antiretroviral Therapy to Pregnant and Lactating Women (Option B+) Assessment and Response System] to systematically identify facility-level challenges in 5 critical areas: (1) monitoring and evaluation; (2) commodity availability; (3) early retention of women initiated on antiretroviral therapy; (4) quality assurance of HIV testing; and (5) early infant HIV diagnosis. LARS involves supervisory visits that are conducted jointly by regional and council health management teams and regional PEPFAR implementing partners. This system creates a transparent mechanism for documenting and tracking corrective actions and resolving issues.¹⁶

REDUCING DIAGNOSTIC AND LABORATORY HURDLES

Achieving elimination of mother-to-child HIV transmission begins with early and accurate identification of HIV infection among pregnant and breastfeeding women. The Global Plan rapidly increased demands for HIV testing and other laboratory services, especially CD4 count testing, and it required coordinated planning between clinicians and laboratorians to ensure functional, quality systems for the collection of samples, and return of results. After the introduction of the Global Plan, provider-initiated “opt-out” rapid HIV testing at antenatal care clinics was implemented more systematically, and the geographic coverage of PMTCT services at antenatal care clinics steadily increased. As a result, the proportion of pregnant women in low- and middle-income countries receiving an HIV test rose from 26% before the Global Plan in 2009 to 46% by the Plan’s midpoint in 2013.⁴¹ Although additional progress is needed to ensure that all pregnant and breastfeeding women receive HIV testing, especially repeat testing in maternity and postpartum care settings, women currently comprise 70% of adults receiving HIV testing services, largely due to testing in antenatal care settings.⁴²

Before the WHO endorsement of Option B+ for pregnant and breastfeeding women in 2012, PMTCT programs relied on CD4 cell count or WHO clinical staging to determine whether a woman was eligible for antiretroviral therapy for her own health. In practice, clinicians often

found the process of staging to be challenging and time consuming, and they frequently relied on a CD4 result or a superficial assessment of the woman's well-being before initiating a pregnant woman on life-long antiretroviral therapy for her own health.⁴³ By removing CD4 testing or staging as a requirement for antiretroviral therapy initiation, Option B+ enabled HIV-positive pregnant or breastfeeding women to bypass substantial laboratory or diagnostic hurdles and immediately initiate life-long antiretroviral therapy, regardless of CD4 count or clinical staging. In addition, by simplifying requirements for antiretroviral therapy initiation and harmonizing antiretroviral regimens for all adults living with HIV, Option B+ facilitated task sharing of antiretroviral therapy initiation and management.⁴⁴

As PMTCT programs implemented rapid, same-day antiretroviral therapy initiation as part of the Option B+ policy, the importance of ensuring the quality of HIV rapid testing, especially to avoid misdiagnosis of HIV—both false positive and false negative results—was highlighted.⁴⁵ Successful HIV rapid testing programs should implement a quality assurance cycle approach with innovative strategies, including developing policy and guidance documents, implementing cost-effective models for training and competency-based qualification and certification for testers, increasing uptake of proficiency testing, implementing a stepwise process for site-level certification of rapid HIV testing sites, and strengthening national reference laboratories to monitor the rapid HIV testing program.⁴⁶ Demand for viral load monitoring in priority countries, however, is significant. The need to rapidly scale-up capacity for viral load quantification in tandem with ongoing efforts to improve testing coverage of HIV-exposed infants may place a heavy burden on laboratory systems and human resources. Harmonizing new and ongoing programmatic efforts to strengthen the common elements of both these services—such as laboratory platforms and sample transport and results return systems—may have a synergistic benefit for their scale-up.

ONGOING CHALLENGES

HIV-Exposed Infant Follow-Up and Diagnosis

In contrast to the growth of other innovative PMTCT services, progress made in expanding coverage of infant virologic testing services, especially in the first 2 months of life, has remained elusive. In the 21 priority Global Plan countries with data available for 2015, only 51% of HIV-exposed infants received virologic testing in the first 2 months of life as part of early infant HIV diagnosis programs.^{47,48}

Although the cascade of events involved in infant virologic testing includes structures and processes outside the clinical site, the proportion of HIV-exposed infants receiving virologic testing in the first 2 months of life is an indicator that ultimately measures collection of a dried blood spot sample from an infant at the clinical site. Persistently, low coverage thus points to ongoing health system challenges with clinical follow-up of HIV-exposed infants. Programs need data tools that seamlessly capture patient details from the antenatal period through delivery and into the postpartum period, thereby helping staff recognize and identify HIV-exposed infants. Task sharing—including optimization and formalization of the role of nonclinical cadres, such as community health workers and lay health counselors—will play

a key role in addressing this ongoing challenge. It can facilitate the following: (1) efficient early recognition of HIV-exposed infants of mothers identified antenatally through PMTCT services; (2) provision of maternal and infant HIV testing services throughout breastfeeding, including in immunization clinics, to ensure identification of pairs of HIV-positive mothers and infants not previously identified or lost from PMTCT services; (3) development of a more robust relationship between patients and their HIV service providers; and (4) tracing of patients lost to follow-up.

Furthermore, although testing by 2 months of age has conventionally been described as “early” infant diagnosis, recent data suggest that this “early” diagnosis may not be early enough for many infants infected during pregnancy and delivery. In a review of 403 records of infants in South Africa who had initiated antiretroviral therapy by 3 months of age, 62% had advanced HIV at initiation (defined as CD4% <25% or absolute CD4 <1500 cells/mm³ or WHO clinical stage 3 or 4).⁴⁹ Implementation of infant virologic testing at birth may enable earlier identification and initiation on antiretroviral therapy of HIV-positive infants who are at greatest risk of early death. There is, however, limited experience with this strategy in resource-limited settings.^{50,51} Furthermore, additional operational guidance is needed to ensure that results of HIV tests at birth can be reliably and rapidly returned, that mothers understand the importance of continued follow-up and HIV testing at the end of the breastfeeding period, and that increased HIV testing translates into an increased proportion of HIV-positive infants initiating antiretroviral therapy in a timely manner. At the national level, countries will need to identify the essential elements that are required in the health system to ensure HIV testing at birth can be successfully implemented, including an adequate clinical and laboratory workforce and systems for monitoring and evaluation.

Continuity of Care for Mothers and Infants Through the PMTCT Cascade and Beyond

Retention of mothers and infants through the end of the breastfeeding period remains a major challenge for elimination of new HIV infections among children and optimal maternal outcomes. Numerous reports demonstrate high rates of maternal loss to follow-up, as well as retention rates for women initiating lifelong antiretroviral therapy in Option B+ programs that are lower than among other adults initiating antiretroviral therapy.^{52–59} Similarly, retention rates of HIV-exposed infants in care through the entire cascade of services to the determination of a final HIV outcome are less than desirable in most country programs.⁵⁴ HIV-positive mothers may disengage or re-engage in care throughout their lives at different points, due to clinic preferences, different pregnancies, or experience with illness. A recent study in South Africa on continuity of care among 312 women who initiated antiretroviral therapy during pregnancy and who were lost to follow-up showed that many women [106 of 284 (37.3%) who were located] sought and re-entered care in a location different from the site where they began care. Among these women, the median time out of care was 308 days (range 101–654)—a substantial period of risk for the mother’s own health as well as for any pregnancies that occur while she is out of touch with the health system.⁶⁰

In the post-Global Plan era, PMTCT programs—as well as monitoring and evaluation systems—must serve a health system paradigm that has the functionality to maintain continuity of care and patient engagement throughout the life course of patients. Using

longitudinal cohort data to track retention along the PMTCT cascade, in combination with innovative strategies for community follow-up, will support early identification of loss to follow-up and opportunities for intervention. Cohort monitoring for PMTCT includes monitoring separate cohorts of HIV-positive pregnant and breast-feeding women on antiretroviral therapy and HIV-exposed infants until a final HIV status is known. These longitudinal approaches to monitoring increase opportunities for data to be used as part of clinical quality improvement initiatives.⁶¹ At the same time, however, one of the major challenges with monitoring and evaluation is that the burden of work is often highest for frontline health care workers at clinical facilities. Although disease- and program-specific requirements may be needed to show progress toward global targets, careful consideration must be taken to balance the burden on health care workers.⁶²

Promoting Respectful Care and Patient-Centered Services

As programs expand and more HIV-positive pregnant and breastfeeding women are initiated and maintained on antiretroviral therapy, a focus on the quality of the care they receive is increasingly important to achieving viral load suppression and virtually eliminating HIV transmission. Quality of care depends on many factors, including the ability of the service delivery system to meet the expectations of users and maintain professional standards. Moving forward, approaches to increasing the quality of services along the PMTCT cascade will require a focus on both patient-centered care and provider motivation.

Current evidence validates the importance of patient-centered care for improving the engagement and retention of mothers to achieve viral suppression and the elimination of HIV transmission to their infants.⁶³ Broadly speaking, a patient-centered approach establishes a “partnership among practitioners, patients, and their families (when appropriate) to ensure that decisions respect patients’ wants, needs, and preferences and that patients have the education and support they need to make decisions and participate in their own care.”⁶⁴ A PMTCT program in Nigeria studied the impact of a family-focused, integrated care package on antiretroviral therapy initiation among pregnant women and retention at 6 and 12 weeks postpartum. This program packaged interventions that have been shown to positively impact PMTCT outcomes individually—including task sharing, integrated services for mothers and babies, and engagement of male partners and other community members—in an approach that is designed to provide more holistic, patient-focused care. Mothers who enrolled in this program were 3 times as likely to initiate antiretroviral therapy and approximately 10 times as likely to be retained than mothers receiving standard services.⁶⁵

Developing a patient-centered approach to HIV clinical services for mothers and their families recognizes that women face opportunity costs when seeking health care services, and that they place differential value on different aspects of care. In 2014, a discrete choice experiment was conducted at PEPFAR-funded Option B+ settings in Ethiopia and Mozambique. The discrete choice experiment methodology asks participants to make hypothetical trade-offs about various aspects of health care service delivery (eg, availability of medications or type of health care provider) to determine the “most preferred” attributes.⁶⁶ The top 2 service attributes in both countries were the “ability to obtain non-

HIV health services” during the same visit and a “respectful provider.”⁶⁷ Of interest, these 2 attributes do not refer to HIV-specific components of care; rather, they reflect components of broader health system capacity.

As patient-centered approaches to PMTCT in sub-Saharan Africa evolve into patient-centered systems of care, innovative strategies are needed to improve health care providers’ performance and the quality of health service delivery at the operational level. One strategy for improving the patient experience and achieving quality outcomes involves providing incentives directly to health care providers. Integration of PMTCT and antiretroviral therapy services into antenatal care clinics increases providers’ workloads.⁶⁸ Despite the benefits of engaging new cadres in HIV care through task sharing, there are still workforce shortages that have limited the ability to meet the goals of the Global Plan.^{19,21,69} Use of incentive systems, such as performance-based financing models, may mitigate the impact that higher workloads have on staff motivation.⁷⁰ By shifting the focus from input to output funding and payment for results, performance-based financing has the potential to improve provider performance and the overall quality of service delivery. In many models, payments are linked to the achievements of predetermined indicators, and the monetary reward is divided between health worker payments and reinvestment in the health facility infrastructure, which can have an overall effect of strengthening the health system. Countries such as Cameroon, the Democratic Republic of the Congo, Mozambique, and Rwanda have implemented performance-based financing initiatives with some degree of success. The experience of Mozambique (presented in Country Case Study 3) illustrates the role that performance-based financing may play in incentivizing health systems improvements.

Additional research is needed to assess the impact of innovative approaches, such as performance-based financing, and new interventions focusing on patient-centered care, on PMTCT outcomes as well as HIV-related services for other populations.

CONCLUSIONS

The Global Plan will have lasting benefits in terms of strengthening the health system of each of the 21 priority countries. In particular, it has enhanced coordination across programs for HIV, SRH, and MNCH, and it has renewed emphasis on strengthening community systems and viewing communities as an integral part of the health system. Although several of the strategies highlighted in this article, such as task sharing and integration of HIV with other clinical services, existed before the Global Plan launch, the Global Plan provided a major impetus to expand and strengthen these initiatives. The Global Plan’s contributions to health systems strengthening initiatives have improved each step of the clinical cascade of services for HIV-positive women and children by doing the following: (1) expanding the workforce and locations where HIV testing and counseling and antiretroviral therapy are available; (2) strengthening the role of the community to support engagement and retention in HIV-related care; and (3) improving the quality of care provided, while emphasizing the need to strengthen systems for commodity management, supportive supervision, and laboratory testing.

As task sharing has become the norm in high HIV prevalence settings, the conversation has shifted to defining professional standards, formalizing the roles of nonphysician and lay cadres, and providing adequate supervision, professional development, and compensation to ensure long-term sustainability of these cadres within the health system.^{23,71–75} Ensuring that HIV services are integrated into a highly functional health system at the national, subnational, and facility levels has become even more imperative as the challenges of retaining women and children living with HIV in care over a lifetime have become more apparent with the scale-up of Option B+.

The Global Plan has now ended, and PMTCT programs still have multiple health systems challenges to overcome. This includes ensuring a coordinated national HIV program, strengthening clinic–laboratory linkages, increasing long-term follow-up of mothers and infants, and improving the patient experience in care in a manner that respects the multilayered influences on health care decision-making. Considerations for addressing these challenges include the following:

- Supporting the professional growth and development of health care workers, who are the life force of the health system, through formalized structures, including supportive supervision.
- Greater investment in and capacity building of community structures, including strengthening the role of community health workers (eg, through formalization into a regulated professional cadre with standardized training and certification structures) to improve outcomes over a lifetime for women and children living with HIV who are in care.
- Pilot testing and research on the impact and sustainability of innovative approaches (such as performance-based financing and accreditation) that may incentivize provider performance and address multiple challenges, including health care worker motivation and infrastructure improvements.
- Research on novel interventions to improve patient satisfaction, provide respectful care, reduce stigma and discrimination, and promote patient-centered services.
- Additional research to improve the quality and functionality of health services, including health workforce management systems.
- Continued research into and documentation of how interventions that have strengthened the health system in the context of PMTCT can be applied to all populations.

COUNTRY CASE STUDIES

Country Case Study 1. Decentralization of Services in Chad

After district-led planning in 36 districts in 10 priority regions in Chad, the number of sites offering services to eliminate new HIV infections among children and improve maternal health more than tripled within 3 years (from 120 sites in 2012 to 463 in 2015). By 2015, antenatal care coverage in these 10 regions had reached 81% (compared with 54%

nationally), with 67% of pregnant women attending antenatal care screened for HIV (compared with 40% nationally) and 53% of pregnant women living with HIV receiving antiretroviral medications for PMTCT (compared with 39% nationally).⁷⁶ Similarly, the percentage of children with HIV receiving antiretroviral therapy increased from 2% in 2011 to 15.8% in 2015.⁷⁶

The process of decentralized planning empowers district health teams and reinforces the devolution of decision-making to the level of the health system that is most directly responsible for service delivery. In Chad, decentralized planning was phased in through the (1) establishment of a national team to support the process, (2) prioritization of interventions, and (3) development of iterative adjustment plans. National program managers and district health teams conducted joint monitoring of decentralized activities to assess the prevailing bottlenecks and disparities, the data management system, the capacity of implementing partners, and integration of PMTCT and pediatric HIV services. As a result, district plans were revised and corrective actions undertaken to continue to improve program results. In addition, task sharing was authorized in September 2013 and is currently implemented in 85% of health facilities where nurses and/or midwives prescribe antiretroviral therapy.

Although Chad has not reached the Global Plan targets, decentralized planning has improved the PMTCT program in the targeted districts and contributed to the significant increase in antiretroviral therapy initiation among women and children living with HIV. It also has helped to advance the objectives of the Global Plan, particularly the provision of services in primary care and at decentralized levels, as well as the development of centralized country-level action plans for elimination of mother-to-child transmission of HIV. The planning process presented a unique opportunity to integrate PMTCT, MNCH, and antiretroviral therapy in a way that is linked to community health interventions. It also informed revisions to the national strategic plan for health that were developed in 2013, as well as the 5-year national HIV strategy from 2012 to 2017. This process included the revision of comprehensive, prioritized, and costed district plans to eliminate new HIV infections among children, reduce deaths during pregnancy due to HIV, and ensure the health and survival of mothers, all in an effort to reflect broader national HIV and MNCH strategies. Finally, the bottleneck analysis and decentralization of HIV services improved coordination of health activities at the regional and district levels, and it enhanced the capacity of health care providers through training, coaching, and job aids.

Country Case Study 2. Expanding PMTCT Services Through Nurse-Initiated and Nurse-Managed Antiretroviral Therapy in Lesotho

Lesotho continues to bear the brunt of a generalized HIV epidemic, with an adult HIV prevalence of 25% and an estimated 310,000 people living with HIV.⁷⁷ Women are disproportionately affected by HIV, with an HIV prevalence of 30% (compared with 19% among men). Despite the massive burden of HIV among women in Lesotho, the country has made particularly strong progress in improving PMTCT services: between 2009 and 2015, mother-to-child HIV transmission decreased by more than 40%.⁴⁸

One of the most critical factors in this progress has been the expansion of the health workforce that has resulted from the reassignment of clinical tasks from physicians to nurses (including the authorization of nurse-initiated and nurse-managed antiretroviral therapy). Lesotho does not have a medical school, which contributes to a very low physician–population ratio of 1:15,231.⁷⁸ The constrained staffing circumstances in Lesotho made it impossible to address the HIV burden without innovative and proactive human resource strategies. Given a physician–nurse ratio of 1:16 in the country, the Ministry of Health of Lesotho focused on leveraging nurses to expand clinical services.⁷⁹ Service delivery innovations such as pre-packaging of antiretroviral therapy with other supplements (eg, iron and vitamin B complex) to be dispensed to HIV-positive pregnant and breastfeeding women by nurses have helped streamline the task. Lesotho’s innovative packaging of PMTCT medications spurred the development of UNICEF’s “mother–baby pack” in 2010. The “mother–baby pack” was a pre-packaged box containing WHO-recommended antibiotics and antiretroviral medications for use starting from 14 weeks of pregnancy through 6 weeks after the infant’s birth to help promote PMTCT.⁸⁰

The innovation of nurse-initiated and nurse-managed antiretroviral therapy as a feature of the health care delivery system in Lesotho has helped improve access to antiretroviral therapy services, even at the lowest health facility levels. It also allows physicians to devote their time to managing complicated cases, such as drug toxicities, treatment failure, and comorbidities. Task sharing has brought about an integrated approach that supports the pregnant woman holistically: pregnant and lactating women, together with their babies, receive antiretroviral therapy services in MNCH clinics for at least 24 months after delivery.

Country Case Study 3. Performance-Based Financing to Improve Outcomes in Mozambique

Performance-based financing, which can be defined as “the transfer of money or material goods conditional on taking a measurable action or achieving a predetermined performance target,”⁸¹ has been used as a strategy to improve health service delivery in low- and middle-income countries, where public health systems are generally faced with multilevel challenges.^{82,83} These challenges may include the following: financial and physical barriers to services access and lack of information at the household/community level; staffing, management, drug, and supplies challenges at the service provision level; and challenges in resource allocation, planning, management, procurement, distribution, quality assurance, cooperation, and incentives at the health sector level.⁸¹

Although implementation of performance-based financing has had varied results across countries, performance-based financing in Mozambique has been shown to improve MNCH outcomes.^{82,83} The Mozambique Ministry of Health—with the support of the Elizabeth Glaser Pediatric AIDS Foundation (EGPAF), a PEPFAR implementing partner—implements the nation’s largest and longest running performance-based financing approach. Since its inception in 2011, this approach has been designed to contribute to the goals of the Global Plan. The program is implemented in 2 provinces, Gaza and Nampula, and it covers all EGPAF-supported health facilities in both provinces. Health facilities are paid according to their performance on 21 indicators that are aggregated in the following groups: prevention of

mother-to-child vertical transmission (3 indicators); pediatric HIV (5 indicators); HIV care and treatment (7 indicators); and maternal and child care (6 indicators). The selected indicators are part of the Mozambique national reporting system, with aggregated reports prepared and submitted monthly based on review of facility registers. Data verification and payment cycles occur quarterly, conducted jointly by EGPAF and the provincial health department. Performance-based financing payments are allocated 40% to facility investment and 60% to salary top-ups, with the latter being distributed among the health facility staff based on predetermined criteria, including years of experience and level of education.

An evaluation of the performance-based financing program found that PMTCT, pediatric, and MCH indicators were the indicators most responsive to the program. For example, antiretroviral therapy initiation among HIV-positive pregnant women increased by more than 250% compared with the baseline in Nampula Province (764 more women per quarter), and it increased by nearly 195% (or 970 more women per quarter) in Gaza (Unpublished data, Centers for Disease Control and Prevention, Mozambique). These results are consistent with those of another study conducted to evaluate results-based financing implemented in Mozambique's central medical store, which found an improvement in performance on selected indicators over a 1-year period of implementation.⁸⁴

Acknowledgments

Supported by the U.S. President's Emergency Plan for AIDS Relief through the U.S. Centers for Disease Control and Prevention.

References

1. UNAIDS. Global Plan Towards the Elimination of New HIV Infections Among Children by 2015 and Keeping Their Mothers Alive: 2011–2015. Geneva, Switzerland: UNAIDS; 2011.
2. Kiragu K, Collins L, Von Zinkernagel D, et al. Integrating PMTCT into maternal, newborn, and child health and related services: experiences from the global plan priority countries. *J Acquir Immune Defic Syndr*. 2017; 75(suppl 1):S36–S42. [PubMed: 28398995]
3. Binagwaho A, Mugwaneza P, Irakoze AA, et al. Scaling up early infant diagnosis of HIV in Rwanda, 2008–2010. *J Public Health Policy*. 2013; 34:2–16. [PubMed: 23191941]
4. Stone-Jimenez, M., Ojikutu, B., Diese, M., et al. Technical Brief: Integrating Prevention of Mother-to-Child Transmission of HIV Interventions With Maternal, Newborn, and Child Health Services. Arlington, VA: USAID's AIDS Support and Technical Assistance Resources; 2011. AIDSTAR-One, Task Order 1
5. Integra Initiative. The effect of integrating HIV on the quality of post-natal care. Integra Initiative Newsletter. 2014
6. Integra Initiative. Contraceptive use and fertility intentions among women living with HIV in Kenya and Swaziland. Integra Initiative Newsletter. 2014
7. McCollum ED, Johnson DC, Chasela CS, et al. Superior uptake and outcomes of early infant diagnosis of HIV services at an immunization clinic versus an “under-five” general pediatric clinic in Malawi. *J Acquir Immune Defic Syndr*. 2012; 60:e107–e110. [PubMed: 22614897]
8. Stinson K, Jennings K, Myer L. Integration of antiretroviral therapy services into antenatal care increases treatment initiation during pregnancy: a cohort study. *PLoS One*. 2013; 8:e63328. [PubMed: 23696814]
9. Suthar AB, Hoos D, Beqiri A, et al. Integrating antiretroviral therapy into antenatal care and maternal and child health settings: a systematic review and meta-analysis. *Bull World Health Organ*. 2013; 91:46–56. [PubMed: 23397350]

10. McNairy ML, Gwynn C, Rabkin M, et al. Increased utilisation of PEPFAR-supported laboratory services by non-HIV patients in Tanzania. *Afr J Lab Med*. 2016;5.
11. Brugha R, Simbaya J, Walsh A, et al. How HIV/AIDS scale-up has impacted on non- HIV priority services in Zambia. *BMC Public Health*. 2010; 10:540. [PubMed: 20825666]
12. Gupta, S., Jahn, A., Tippet Barr, B., et al. Malawi's Option B+ 2011–2015: the impact of rapid ART decentralization. Presented at: Conference on Retroviruses and Opportunistic Infections; 2016; Boston, MA.
13. World Health Organization. WHO Technical Guidance Note: Strengthening Inclusion of Maternal, Newborn and Child Health in Proposals to the Global Fund and Other Partners. Geneva, Switzerland: World Health Organization; 2011.
14. Kalua T, Tippet Barr BA, van Oosterhout JJ, et al. Lessons learned from option B+ in the evolution toward “test and start” from Malawi, Cameroon, and the United Republic of Tanzania. *J Acquir Immune Defic Syndr*. 2017; 75(suppl 1):S43–S50. [PubMed: 28398996]
15. Centers for Disease Control and Prevention. Impact of an innovative approach to prevent mother-to-child transmission of HIV—Malawi, July 2011–September 2012. *MMWR Morb Mortal Wkly Rep*. 2013; 62:148–151. [PubMed: 23446514]
16. United Republic of Tanzania Ministry of Health, Community Development, Gender, Elderly, and Children (MoHCDGEC). National Program Report—Prevention of Mother to Child Transmission of HIV. Dar es Salaam, Tanzania: MoHCDGEC; 2015.
17. Maddison AR, Schlech WF. Will universal access to antiretroviral therapy ever be possible? The health care worker challenge. *Can J Infect Dis Med Microbiol*. 2010; 21:e64–e69. [PubMed: 21358879]
18. Ojikutu B, Makadzange AT, Gaolathe T. Scaling up ART treatment capacity: lessons learned from South Africa, Zimbabwe, and Botswana. *Curr HIV/AIDS Rep*. 2008; 5:94–98. [PubMed: 18510895]
19. World Health Organization. Density of Doctors, Nurses and Midwives in the 49 Priority Countries. Geneva, Switzerland: WHO; 2010.
20. World Health Organization. Global Strategy on Human Resources for Health: Workforce 2030: Draft for the 69th World Health Assembly. Geneva, Switzerland: World Health Organization; 2016.
21. [Accessed July 22, 2016] Global Health Observatory data [database online]. 2016. Available at: <http://www.who.int/gho/en/>
22. Samb B, Celletti F, Holloway J, et al. Rapid expansion of the health workforce in response to the HIV epidemic. *N Engl J Med*. 2007; 357:2510–2514. [PubMed: 18077816]
23. Zuber A, McCarthy CF, Verani AR, et al. A survey of nurse-initiated and -managed antiretroviral therapy (NIMART) in practice, education, policy, and regulation in east, central, and southern Africa. *J Assoc Nurses AIDS Care*. 2014; 25:520–531. [PubMed: 24739661]
24. de Jongh TE, Gurol-Urganci I, Allen E, et al. Barriers and enablers to integrating maternal and child health services to antenatal care in low and middle income countries. *BJOG*. 2016; 123:549–557. [PubMed: 26861695]
25. The Office of the U.S. Global AIDS Coordinator. PEPFAR 3.0. Controlling the Epidemic: Delivering on the Promise of an AIDS-free Generation. Washington, DC: The Office of the U.S. Global AIDS Coordinator; 2014.
26. Elizabeth Glaser Pediatric AIDS Foundation. Zimbabwe Program Brief: Implementing a District Focal Person Model to Strengthen PMTCT Service Delivery: Early Lessons. Washington, DC: Elizabeth Glaser Pediatric AIDS Foundation; 2012.
27. Zimbabwe Ministry of Health and Child Welfare. Prevention of Mother to Child Transmission of HIV 2012 Annual Report. Harare, Zimbabwe: Zimbabwe Ministry of Health and Child Welfare; 2012.
28. Matheson R, Brion S, Sharma A, et al. Realizing the promise of the global plan: engaging communities and promoting the health and human rights of women living with HIV. *J Acquir Immune Defic Syndr*. 2017; 75(suppl 1):S86–S93. [PubMed: 28399001]
29. World Health Organization, Global Health Alliance. Global Experience of Community Health Workers for Delivery of Health Related Millennium Development Goals: A Systematic Review,

Country Case Studies, and Recommendations for Integration Into National Health System. Geneva, Switzerland: World Health Organization; 2010.

30. Kim MH, Ahmed S, Buck WC, et al. The Tingathe programme: a pilot intervention using community health workers to create a continuum of care in the prevention of mother to child transmission of HIV (PMTCT) cascade of services in Malawi. *J Int AIDS Soc.* 2012; 15(suppl 2): 17389. [PubMed: 22789644]
31. McPake B, Edoa I, Witter S, et al. Cost-effectiveness of community-based practitioner programmes in Ethiopia, Indonesia and Kenya. *Bull World Health Organ.* 2015; 93:631–639A. [PubMed: 26478627]
32. Mwai GW, Mburu G, Torpey K, et al. Role and outcomes of community health workers in HIV care in sub-Saharan Africa: a systematic review. *J Int AIDS Soc.* 2013; 16:18586. [PubMed: 24029015]
33. Selke HM, Kimaiyo S, Sidle JE, et al. Task-shifting of antiretroviral delivery from health care workers to persons living with HIV/AIDS: clinical outcomes of a community-based program in Kenya. *J Acquir Immune Defic Syndr.* 2010; 55:483–490. [PubMed: 20683336]
34. Namukwaya Z, Barlow-Mosha L, Mudiopu P, et al. Use of peers, community lay persons and Village Health Team (VHT) members improves six-week postnatal clinic (PNC) follow-up and early infant HIV diagnosis (EID) in urban and rural health units in Uganda: a one-year implementation study. *BMC Health Serv Res.* 2015; 15:555. [PubMed: 26666331]
35. O'Laughlin KN, Wyatt MA, Kaaya S, et al. How treatment partners help: social analysis of an African adherence support intervention. *AIDS Behav.* 2012; 16:1308–1315. [PubMed: 21947835]
36. Rotheram-Borus MJ, Richter LM, van Heerden A, et al. A cluster randomized controlled trial evaluating the efficacy of peer mentors to support South African women living with HIV and their infants. *PLoS One.* 2014; 9:e84867. [PubMed: 24465444]
37. Okonji, E., Sandfolo, S., Myers, A., et al. 2013 Annual Evaluation of the Prevention of Mother-to-Child Transmission (PMTCT) through Peer Education and Psychosocial Support Services in Kenya, Lesotho, Malawi, South Africa, Swaziland and Uganda. Cape Town, South Africa: m2m Department of Programmes and Technical Support; 2014.
38. [Accessed July 21, 2016] UNAIDS joins forces with the One Million Community Health Workers campaign to achieve the 90–90–90 treatment target. Available at: http://www.unaids.org/en/resources/presscentre/featurestories/2016/february/20160202_909090
39. Tulenko K, Mogedal S, Afzal MM, et al. Community health workers for universal health-care coverage: from fragmentation to synergy. *Bull World Health Organ.* 2013; 91:847–852. [PubMed: 24347709]
40. World Health Organization. Use of Antiretroviral Drugs for Treating Pregnant Women and Preventing HIV Infection in Infants: Programmatic Update. Geneva, Switzerland: World Health Organization; 2012.
41. UNAIDS. The Gap Report. Geneva, Switzerland: UNAIDS; 2014.
42. World Health Organization. Fact Sheet to the WHO Consolidated Guidelines on HIV Testing Services. Geneva, Switzerland: World Health Organization; 2015.
43. MacPherson P, MacPherson EE, Mwale D, et al. Barriers and facilitators to linkage to ART in primary care: a qualitative study of patients and providers in Blantyre. *Malawi J Int AIDS Soc.* 2012; 15:18020. [PubMed: 23336700]
44. Hamilton E, Bossiky B, Ditekemena J, et al. Using the PMTCT cascade to accelerate achievement of the global plan goals. *J Acquir Immune Defic Syndr.* 2017; 75(suppl 1):S27–S35. [PubMed: 28398994]
45. World Health Organization. Consolidated Guidelines on HIV Testing Services: 5Cs: Consent, Confidentiality, Counselling, Correct Results and Connection 2015. Geneva, Switzerland: World Health Organization; 2015. 9789241508926
46. World Health Organization. Improving the Quality of HIV-related Point-of-care Testing: Ensuring the Reliability and Accuracy of Results. Geneva, Switzerland: World Health Organization; 2015.
47. Essajee S, Bhairavabhotla R, Penazzato M, et al. Scale-up of early infant HIV diagnosis and improving access to pediatric HIV care in global plan countries: past and future perspectives. *J Acquir Immune Defic Syndr.* 2017; 75(suppl 1):S51–S58. [PubMed: 28398997]

48. UNAIDS. On the Fast Track to an AIDS-free Generation: The Incredible Journey of the Global Plan Towards the Elimination of New HIV Infections Among Children by 2015 and Keeping Their Mothers Alive. Geneva, Switzerland: UNAIDS; 2016.
49. Innes S, Lazarus E, Otjombe K, et al. Early severe HIV disease precedes early antiretroviral therapy in infants: are we too late? *J Int AIDS Soc.* 2014; 17:18914. [PubMed: 24925044]
50. Mazanderani, A., Kufa-Chakezha, T., Moyo, F., et al. Introduction of Birth Testing Into the South African National Consolidated Guidelines. Presented at: Conference on Retroviruses and Opportunistic Infections; 2016; Boston, MA.
51. Maritz, J., Hsiao, N., Preiser, W., et al. Low Uptake of Routine Infant Diagnostic Testing Following HIV PCR Testing at Birth. Presented at: Conference on Retroviruses and Opportunistic Infections; 2016; Boston, MA.
52. Woelk, G., Berhan, A., Kudiabor, K., et al. HIVCore Report: A Secondary Analysis of Retention Across the PMTCT Cascade in Selected Countries: Rwanda, Malawi, Kenya, and Swaziland. Washington, DC: USAID; 2015.
53. Hussain A, Moodley D, Naidoo S, et al. Pregnant women's access to PMTCT and ART services in South Africa and implications for universal antiretroviral treatment. *PLoS One.* 2011; 6:e27907. [PubMed: 22162993]
54. Kieffer MP, Mattingly M, Giphart A, et al. Lessons learned from early implementation of option B +: the Elizabeth Glaser Pediatric AIDS Foundation experience in 11 African countries. *J Acquir Immune Defic Syndr.* 2014; 67(suppl 4):S188–S194. [PubMed: 25436817]
55. Killam WP, Tambatamba BC, Chintu N, et al. Antiretroviral therapy in antenatal care to increase treatment initiation in HIV-infected pregnant women: a stepped-wedge evaluation. *AIDS.* 2010; 24:85–91. [PubMed: 19809271]
56. Namara Lugolobi, E., Namukwaya, Z., Musoke, P., et al. Retention in Care Among Women Initiated on Option B Plus in the Antenatal Clinic (ANC) and Labour Ward at Mulago National Referral Hospital Kampala, Uganda [TUAC0102]. Presented at: 7th IAS Conference on HIV Pathogenesis, Treatment, and Prevention; 2013; Kuala Lumpur, Malaysia.
57. Tenthani L, Haas AD, Tweya H, et al. Retention in care under universal antiretroviral therapy for HIV-infected pregnant and breastfeeding women ("Option B+") in Malawi. *AIDS.* 2014; 28:589–598. [PubMed: 24468999]
58. Tudor Car L, Brusamento S, Elmoniry H, et al. The uptake of integrated perinatal prevention of mother-to-child HIV transmission programs in low- and middle-income countries: a systematic review. *PLoS One.* 2013; 8:e56550. [PubMed: 23483887]
59. Wettstein C, Mugglin C, Egger M, et al. Missed opportunities to prevent mother-to-child-transmission: systematic review and meta-analysis. *AIDS.* 2012; 26:2361–2373. [PubMed: 22948267]
60. Clouse, K., Vermund, S., Maskew, M., et al. Continuity of Care Among Pregnant Women Lost to Follow-up After Initiating ART [792]. Presented at: Conference on Retroviruses and Opportunistic Infections; 2016; Boston, MA.
61. The Interagency Task Team on the Prevention and Treatment of HIV Infection in Pregnant Women, Mothers and Children (IATT). Monitoring & Evaluation Framework for Antiretroviral Treatment for Pregnant and Breastfeeding Women Living With HIV and Their Infants (IATT M&E Option B + Framework). New York, NY: Centers for Disease Control and Prevention, World Health Organization, UNICEF; 2015.
62. World Health Organization. A Rapid Assessment of the Burden of Indicators and Reporting Requirements for Health Monitoring. Geneva, Switzerland: World Health Organization; 2014.
63. Dwamena F, Holmes-Rovner M, Gaulden CM, et al. Interventions for providers to promote a patient-centred approach in clinical consultations. *Cochrane Database Syst Rev.* 2012; 12:CD003267. [PubMed: 23235595]
64. Hurtado, M., Swift, E., Corrigan, J. Envisioning the National Health Care Quality Report. Washington, DC: The National Academies Press; 2001.
65. Aliyu MH, Blevins M, Audet CM, et al. Integrated prevention of mother-to-child HIV transmission services, antiretroviral therapy initiation, and maternal and infant retention in care in rural north-

- central Nigeria: a cluster-randomised controlled trial. *Lancet HIV*. 2016; 3:e202–e211. [PubMed: 27126487]
66. Kruk ME, Paczkowski M, Mbaruku G, et al. Women's preferences for place of delivery in rural Tanzania: a population-based discrete choice experiment. *Am J Public Health*. 2009; 99:1666–1672. [PubMed: 19608959]
 67. Kruk ME, Riley PL, Palma AM, et al. How can the health system retain women in HIV treatment for a Lifetime? A discrete choice experiment in Ethiopia and Mozambique. *PLoS One*. 2016; 11:e0160764. [PubMed: 27551785]
 68. Simba D, Kamwela J, Mpembeni R, et al. The impact of scaling-up prevention of mother-to-child transmission (PMTCT) of HIV infection on the human resource requirement: the need to go beyond numbers. *Int J Health Plann Manage*. 2010; 25:17–29. [PubMed: 18770876]
 69. McCoy D, McPake B, Mwapasa V. The double burden of human resource and HIV crises: a case study of Malawi. *Hum Resour Health*. 2008; 6:16. [PubMed: 18699994]
 70. Toure H, Audibert M, Dabis F. To what extent could performance-based schemes help increase the effectiveness of prevention of mother-to-child transmission of HIV (PMTCT) programs in resource-limited settings? A summary of the published evidence. *BMC Public Health*. 2010; 10:702. [PubMed: 21080926]
 71. Emdin CA, Chong NJ, Millson PE. Non-physician clinician provided HIV treatment results in equivalent outcomes as physician-provided care: a meta-analysis. *J Int AIDS Soc*. 2013; 16:18445. [PubMed: 23827470]
 72. Iwu EN, Holzemer WL. Task shifting of HIV management from doctors to nurses in Africa: clinical outcomes and evidence on nurse self-efficacy and job satisfaction. *AIDS Care*. 2014; 26:42–52. [PubMed: 23701374]
 73. Kredo T, Adeniyi FB, Bateganya M, et al. Task shifting from doctors to non-doctors for initiation and maintenance of antiretroviral therapy. *Cochrane Database Syst Rev*. 2014; 7:CD007331.
 74. McCarthy CF, Voss J, Verani AR, et al. Nursing and midwifery regulation and HIV scale-up: establishing a baseline in East, Central and Southern Africa. *J Int AIDS Soc*. 2013; 16:18051. [PubMed: 23531276]
 75. Sanne I, Orrell C, Fox MP, et al. Nurse versus doctor management of HIV-infected patients receiving antiretroviral therapy (CIPRA-SA): a randomised non-inferiority trial. *Lancet*. 2010; 376:33–40. [PubMed: 20557927]
 76. Republic of Chad Ministry of Public Health. Progress Report on PMTCT Activities in Chad. N'Djamena, Chad: Republic of Chad Ministry of Public Health; 2015.
 77. UNAIDS. Prevention Gap Report. Geneva, Switzerland: UNAIDS; 2016.
 78. Lesotho Ministry of Health and Social Welfare. Human Resource Development and Strategic Plan 2005–2025. Silver Spring, MD: Medical Care Development International; 2004.
 79. Lesotho Ministry of Health and Social Welfare. Establishment Analysis Using Human Resources Information System. Maseru, Lesotho: Lesotho Ministry of Health and Social Welfare; 2013.
 80. [Accessed 22 July 2016] Mother-baby pack update: more efforts needed to prevent mother-to-child transmission of HIV. Available at: http://www.unicef.org/aids/index_58357.html
 81. Eichler, R. Can “Pay for Performance” Increase Utilization by the Poor and Improve the Quality of Health Services? A Discussion Paper for the First Meeting of the Working Group on Performance-based Incentives Center for Global Development. Washington, DC: Broad Branch Associates; 2006.
 82. Meessen B, Soucat A, Sekabaraga C. Performance-based financing: just a donor fad or a catalyst towards comprehensive health-care reform? *Bull World Health Organ*. 2011; 89:153–156. [PubMed: 21346927]
 83. Witter S, Fretheim A, Kessy FL, et al. Paying for performance to improve the delivery of health interventions in low- and middle-income countries. *Cochrane Database Syst Rev*. 2012; 2:CD007899.
 84. Spisak C, Morgan L, Eichler R, et al. Results-based financing in Mozambique's central medical store: a review after 1 year. *Glob Health Sci Pract*. 2016; 4:165–177. [PubMed: 27016552]